

## CABRIOLET VEHICLE

### CROSS-REFERENCE TO RELATED APPLICATION(S)

This application is a US National Phase of International Application No. PCT/DE 2005/000053, filed January 15<sup>th</sup>, 2005, which claims priority to German 10 2004 003 020.0, filed January 20<sup>th</sup>, 2004. The entire contents of the above identified applications are incorporated herein by reference.

### TECHNICAL FIELD

**[0001]** The invention relates to a cabriolet vehicle with a roof, which at least in some areas has a flexible cover, according to the preamble of Claim 1.

### BACKGROUND OF THE INVENTION

**[0002]** It is known that the front roof area in a cabriolet vehicle of the mentioned type, when the roof is opened, lies with its rigid roof top over other areas of the roof in the fashion of a cover and remains openly visible from the top. The roof then lies in an auto body recess made in the outside surface of the auto body. It encloses the recess at least on the sides and rear. In the front it is indirectly or often directly connected to a passenger compartment.

**[0003]** In this case, on the one hand the rear limitation of the recess, which represents a front edge of the body outside surface connected farther to the rear is designed in a curved shape, which runs forward to the vehicle sides, for a harmonic transition of the edges bordering the recess. Functionally this is also desirable for the largest possible access opening beneath a trunk lid adjacent to the rear, which is supposed to lie with its front limitation edge (in the direction of travel) parallel to the front edge that borders the recess.

**[0004]** On the other hand, a roof of the mentioned type, when opened, is supposed to fold in behind the rigidly held from below front roof area so that the folding edge there, if possible, runs at least almost linearly in a 90° angle relative to the direction of travel over the roof width in

a top view in order to ensure a clean cover trend when the roof is closed without additional areas of loose fabric or folds.

**[0005]** Consequently, a conflict arises on the rear edge of the limitation of the recess at least in the side corner areas between the linear rear edge of the front roof part which then lies on the top, and the limitation edge of the recess which points forward on the transverse sides. If the corners of the front roof part during roof movement are supposed to be passed by the edge without collision, a significant spacing between the parts is therefore essential. Consequently, an elongated gap between the edge of the recess and the folding edge of the front roof part positioned to the rear remains at least in the area of the vertical vehicle longitudinal center plane in the vehicle longitudinal direction. Such gaps, however, are aesthetically undesirable and without additional measures also make possible unauthorized access into the trunk situated beneath it.

**[0006]** An attempt to mitigate this conflict consists of providing for the rear end area of the recess a narrow moving hinged cover almost crescent-shaped in top view whose rear edge lies essentially across the vehicle and whose front edge lies in the desired curvature with the forward facing areas. This moving cover, however, requires additional drive and control expense and with its additional side joints interferes with the appearance of the outer surface of the auto body.

## SUMMARY OF THE INVENTION

**[0007]** The underlying problem solved by the invention is to optimize storage of a roof with the front roof part lying in the same orientation in the stored position as in the closed position.

**[0008]** The invention solves this problem by a cabriolet vehicle with the features of Claim 1 and by a cabriolet vehicle with the features of Claim 3, which can be implemented individually or advantageously in combination with each other. With respect to additional advantageous embodiments of the invention, Claims 2 and 4 to 8 are referred to.

**[0009]** According to the invention, in the design according to Claim 1 the gap is reduced by the support step that is covered by a flexible lining. Moving cover parts of any type are

therefore unnecessary. An improvement is therefore achieved both optically and as security against break-in.

**[0010]** The production and part expense is therefore particularly low if the support step is designed as a one-piece molded part.

**[0011]** The design according to Claim 3, according to which the lining is formed as a textile curtain, which is secured over a large part of the width of the recess and on the rear end of the moving roof, ensures reliable and flexibly movable gap reduction. In particular, a combination of Claims 1 and 3 can be advantageous, according to which the curtain overlaps the support step when the roof is open so that its tension can be ensured at any time.

**[0012]** The part expense is further reduced when the molded part also includes a fastening device for the lining behind the support step so that no separate parts are required for this either, but, for example, pulling of a piping into the fastening device can very simply effect the fastening of the lining.

**[0013]** The lining can advantageously cover visually from above almost completely the gap between the edge and the opened roof.

**[0014]** Additional advantages and features of the invention are apparent from a practical example of the object of the invention schematically shown in the drawing and described below.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0015]** In the drawings:

**[0016]** Figure 1 shows a vehicle according to the invention in a schematic view truncated on the vertical longitudinal center plane from the top with the roof opened,

**[0017]** Figure 2 shows a view similar to that of Figure 1 but with the roof closed,

**[0018]** Figure 3 shows a vehicle according to the prior art in a view similar to that of Figure 1,

- [0019] Figure 4 shows a schematized side view truncated in the lower portion in the area of the vertical longitudinal center plane of the vehicle according to the invention with the roof closed and locked,
- [0020] Figure 5 shows a view similar to that of Figure 4 with a fully opened roof,
- [0021] Figure 6 shows a detail section of the rear roof connection in the position according to Figure 4,
- [0022] Figure 7 shows a view similar to that of Figure 6 with the opened roof according to Figure 5,
- [0023] Figure 8 shows a schematized side view truncated in the lower area in the closed and opened roof position according to Figures 4 and 5,
- [0024] Figure 9 shows a schematized perspective view of the rear window and its connection in the closed and opened roof,
- [0025] Figure 10 shows a view similar to that of Figure 9, but with a front roof area additionally shown in the open roof position,
- [0026] Figure 11 shows a schematized perspective view of the opened roof oblique from the top,
- [0027] Figure 12 shows a view similar to that of Figure 11, but with the rear roof area lying below it additionally shown,
- [0028] Figure 13 shows a top view of the opened roof,
- [0029] Figure 14 shows a perspective detail view of the support step,
- [0030] Figure 15 shows the part according to Figure 14 in the position mounted on the vehicle.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0031]** A two-seat vehicle 1 is shown in the drawing figures. The invention is also applicable, for example, to a four- or multi-seat cabriolet vehicle provided with a rear seat.

**[0032]** The vehicle 1 comprises in its upper area and an area indirectly or directly adjacent to a windshield frame 2 a roof 3 movable relative to auto body 4, which can include a flexible roof cover 6 outside a rear window 5.

**[0033]** In direction of travel F the roof 3 contains a front roof area 7, which includes a rigid end area 8 overlapped at least in areas by a cover 6, so-called roof top, for its fastening on windshield frame 2. The front roof area 7 during opening of the roof (transition from Figure 2 to Figure 1) can be stored in a body recess 9 in the same orientation as in the closed state, i.e., the surface 10 of the front roof area 7 pointing upward and outward with the roof 3 in the closed position, and the surface 10 also points upward in the open state of roof 3. Roof 3 can be stored for this purpose in a so-called Z-fold, in which the cover 6, is stored Z-shaped with an upper section 6a stored above roof top 8, and a lower section 6c stored around the rear window 5 then lying lowermost and an intermediate section 6b connecting them diagonally (Figure 5).

**[0034]** The body recess 9 that serves to accommodate the opened roof 3 is bounded at least on the back and partly on the sides by an edge 11 of the body. This edge 11 is curved overall so that its side sections 11a include a component that points in the direction of travel F. It therefore lies parallel to a front closure edge 12 of a trunk lid 13 and offset from it by a stabilizing cross bar 25 (Figure 1) or can be formed by said edge itself (Figure 6, Figure 7).

**[0035]** If one intends to open such a roof 3 and store it in recess 9, the limitation edge 11 of body 4 must be displaced very far rearward or, as shown in Figure 3, an additional hinged cover 17 must be provided, which can open for passage of roof 3 and therefore avoid collision of the corner area 19, shown with a dashed line, with the auto body 4. However, this requires the described additional control expense and the visually disadvantageous additional joints 18.

**[0036]** Consequently, according to the invention, a lining 15 is provided, which overlaps partially a support step 16 arranged in direction of travel F in front of edge 11 instead of cover 17 for lining of a remaining gap 14 between the front roof part 7 and edge 11. This support step 16 in the practical example is formed as a one-piece molded part from plastic, magnesium die

casting or light metal foam. The design, however, can also be in many different forms. The support step 16 can also be formed from the flexible, rubber-elastic material in order to also permit pressure contact of the front roof area 7 with its rear edge 20 and pressing of lining 15 connected with it. In addition, the support step 16 can also be displaceable in order to permit a larger passage opening for roof 3 in the rearward displaced position and to largely span gap 14 in the forward displaced position.

**[0037]** In the practical example the support step 16 runs parallel to edge 11 and is therefore also curved to the vehicle transverse sides in the travel direction F. It can also lie parallel to the rear edge 20 of the front roof area 7 and then be essentially linear.

**[0038]** In each case, the lining 15 supported by step 16 covers in its essential parts the gap 14 between the rear edge 20 of the stored front roof area 7, and the edge 11 of the body 4 that bounds the recess on the back. The lining 15 is formed here as a textile curtain and by an area of the roof cover 6 lying beneath the rear window 5 when the roof is closed (Figure 4, Figure 9). No additional components or assembly steps are therefore required for lining 15 itself.

**[0039]** The textile curtain 15 with the roof opened (Figure 5) lies so that it initially runs upward from its connection 21 beneath edge 11 and forms a horizontal surface 22, before it drops downward to the rear window 5 lying below in the storage position. For this purpose it can extend in particular over the already described support step 16, which then engages the curtain 15 from below, beneath its horizontal surface 22, and supports it. The surface 22 lies at roughly the same height as the outer surface 10 of the front roof part 7 and the additional outer surface 24 of body 4 lying behind edge 11.

**[0040]** The connection 21 can be integrally formed in particular by a fastening device 23 in the molded part that forms the support step 16, for example, by an engagement channel for a piping. The one-piece molded part can then include both the support step 16 and the fastening device 23 and therefore be particularly suitable for assembly. Since the connection 21 lies under the edge 11, it need not follow its curvature, but can depending on the conditions run almost linearly in cover 6 over the vehicle width.

**[0041]** The molded part can also form a water channel between the fastening device 23 and the support step 16.

**[0042]** The lining 15 can also be formed by a separate part, for example a folding part, a roller shutter or the like.

**[0043]** The invention is applicable both for manually and semi or fully automatically moved roofs 3.

**[0044]** While the best modes for carrying out the invention have been described in detail, those familiar with the art to which this invention relates will recognize various alternative designs and embodiments for practicing the invention within the scope of the appended claims.